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Monet

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[54] **METHOD AND APPARATUS FOR MANAGING THE USE OF AN ELECTRONIC LOCK FOR A MOBILE RADIO TELEPHONE**

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[58] **Field of Search** ..... 179/2 E, 2 EC, 90 D, 179/2 CA, 18 DA, 2 A, 2 DP; 340/825.31; 379/58, 66, 59, 60, 63

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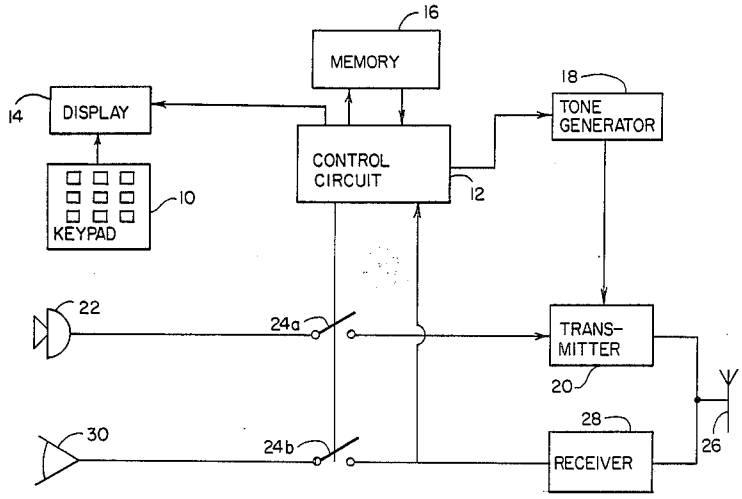
[57] **ABSTRACT**

A method and apparatus for managing an electronic radio telephone lock in which the electronic lock can be rendered operative or inoperative only by first entering a predetermined code so as to prevent unauthorized use as well as accidental or unauthorized locking, code changes, etc.

6 Claims, 1 Drawing Figure



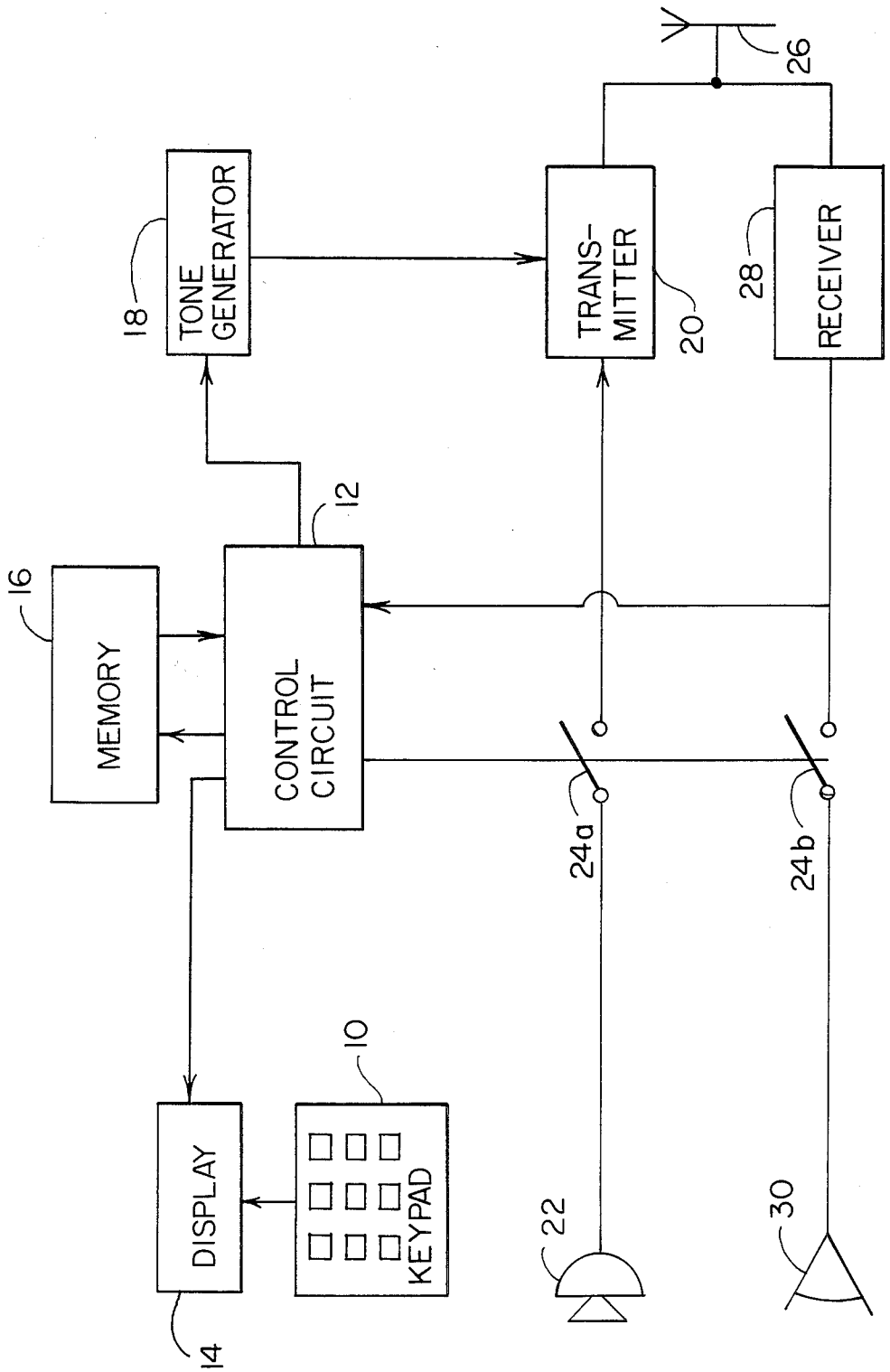

26
TONE GENERATOR
18
TRANS-MITTER
20
28
RECEIVER
12
16
MEMORY
CONTROL CIRCUIT
24a
24b
10
DISPLAY
KEYPAD
14
22
30

FIG. 1

METHOD AND APPARATUS FOR MANAGING THE USE OF AN ELECTRONIC LOCK FOR A MOBILE RADIO TELEPHONE

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for managing the electronic lock of a radio telephone. More particularly, it relates to a method and apparatus for preventing the unauthorized use of the telephone as well as the inadvertent or intentional tampering with the electronic locking device.

Subscribers to telephone service are often charged by the operator of the telephone system for each minute that the telephone is in use, and additional fees per minute of use may also be charged for "long distance" calls. This is particularly true for special purpose telephones such as mobile radio telephones. Accordingly, it is often important to limit operational access of unauthorized persons to a telephone.

The nature of the use of telephones and particularly of mobile radio telephones is such that rigorous control of access to the telephone instrument is difficult to ensure. Often, the goal of limiting access to unauthorized personnel is in direct conflict with a goal of allowing ease of access to authorized personnel. For example, mobile telephones are often installed in automobiles to permit use of the telephone system while driving. However, the authorized user of the telephone is frequently not the only person with access to the automobile. Parking attendants, automobile service personnel and persons borrowing an automobile generally have to be given access to the interior compartment of an automobile and thus have access to a mobile telephone located therein. Likewise, land based telephones must frequently be placed in locations where rigorous control of access to the dialing apparatus of such telephones is difficult to achieve. A telephone installed in a public area may be convenient for authorized users but, at the same time, is accessible to unauthorized persons.

The use of both physical and electronic locks to control the use of telephones is well known. Physical locks, which conventionally are engaged and disengaged by means of a key or combination, mechanically impede a would-be user from obtaining access to a portion of the telephone instrument necessary for dialing.

Telephone systems which utilize a key or other physical device to lock and unlock the telephone instrument require the telephone user to carry the key whenever use of the telephone is desired. An authorized user of a telephone who, for whatever reason, does not have the unlocking key in his possession is denied the ability to place telephone calls.

Electronic lock systems generally obviate the need for carrying a key because such systems generally can be locked by activation of a single switch or button and are unlocked by the execution of the correct unlocking sequence. Other known electronic locks automatically lock the controlled device after each use. However, such electronic systems can often be accidentally locked or locked by unauthorized persons, by the mere activation of a simple locking switch without any knowledge of the operating code.

Electronic locks are known in which telephone dialing may be inhibited by the activation of a switch or button on the telephone instrument. When the locking button or switch is activated, the control circuits in the telephone instrument inhibit dialing by not transmitting the dialing signals necessary to establish communication between the telephone instrument and the telephone network. Frequently, such electronic locks may be unlocked by performing an unlocking sequence consisting of entering an unlock code comprising a predetermined code sequence. If the correct code sequence is input, the control circuit removes the inhibit and enables the transmission of the dialing signals. Electronic locks for telephone instruments of this type are disclosed in U.S. Pat. No. 4,099,033 issued to Murray on July 4, 1978; U.S. Pat. No. 4,314,108 issued to Shauvit on Feb. 2, 1982; and United Kingdom Patent Application No. 2,086,188 by Feuell filed May 6, 1982.

If a lock is accidentally locked, or tampered with, an authorized user of the mobile telephone who does not know the unlocking sequence will be denied use of the telephone. Additionally, an authorized user who mistakenly believes that he knows the unlocking sequence may intentionally activate the locking mechanism and henceforth be unable to unlock the system, possibly at the expense of an expensive service call to open the instrument for the purpose of reprogramming the locking sequence.

It is therefore an object of the present invention to obviate these and other problems in known electronic locking systems and to provide a novel method and apparatus for managing the use of an electronic lock, particularly for mobile radio telephones.

It is another object of the present invention to provide a novel method and apparatus for controlling the use of telephone instruments without the use of a key.

It is yet another object of the present invention to provide a novel method and apparatus for ensuring the correctness of the unlocking sequence prior to engaging an electronic lock.

These and many other objects and advantages of the present invention will be apparent to one skilled in the art from the claims when read in conjunction with the appended drawing.

DRAWING

FIG. **1** is a functional block diagram of an embodiment of the apparatus of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

One embodiment of the electronic locking system of the present invention is illustrated in a mobile telephone instrument in FIG. **1**. In the figure, an input device such as a keypad **10** provides input signals to a control circuit **12**. The keypad **10** contains a plurality of keys, some of which represent commands and others of which represent the digits 0 through 9 in a standard telephone instrument keypad. To assist a telephone user, a display **14** is provided to echo commands and digits entered on the keypad **10**. The control circuit **12** communicates with a storage device **16** and controls the operation of dialing signals from a dialing signal generator **18** to a transmitter **20**. The audio signals to be transmitted by the telephone instrument are received by a microphone **22** and are converted to electrical signals which are passed to the transmitter **20** through one portion of a ganged switch **24**. Similarly, electrical signals representative of audio signals are received by the telephone instrument through an antenna **26** to a receiver **28** and subsequently to a speaker **30**. The speaker **30** converts the electrical signals into audio signals. The electrical connection

between the receiver **28** and the speaker **30** is switched via the other portion of the ganged switch **24**. Additionally, signals received by the receiver **28** are passed directly to the control circuit **12** so that incoming telephone calls may be detected and announced.

If a user wishes to place a call on the telephone instrument which is enabled or unlocked, the user depresses appropriate keys on keypad **10** to indicate that a call is to be placed and the telephone number which the user desires to call. Upon receipt of the signal from the keypad **10**, the control circuit **12** performs a standard communications repertoire first to obtain an available transmission channel from a base station and second to send the appropriate tone signals from the dialing signal generator **18** to the antenna **26** through the transmitter **20** in order to signal the base station of the telephone number of the telephone being called. To complete the audio circuit which enables the user to transmit his voice signal and hear the incoming signal, the control circuit **14** closes ganged switch **24**, connecting the microphone **22** to the transmitter **20** and the receiver **28** to the speaker **30**.

Subsequently, when the telephone call or calls are completed and the user desires to inhibit any further telephone dialing by unauthorized persons, the user depresses certain keys of the keypad **10** which correspond to the unlock sequence and indicates to the control circuit **14** via one of the keys of the keypad **10** that he desires the telephone be locked. Upon receiving the unlock sequence and the lock command, the control circuit **12** compares the unlock sequence to a sequence previously stored in the storage device **16**. If the unlock sequence received from the keypad **10** matches the sequence stored in the storage device **16**, the control circuit **14** disables the telephone instrument by opening the ganged switch **24**. If the unlock sequence received from the keypad **10** does not match the sequence stored in the storage device **16**, the control circuit **12** ignores the lock command and provides an indication on display **14** that the telephone instrument is still unlocked.

The unlock sequence which both locks and unlocks the telephone instrument may be a predetermined sequence of input signals from the keypad **10**. Although described above as preceding the input signal indicating a lock command, the unlock sequence may also be entered after the lock command or both before and after the entry of the lock command. Indeed, the lock command may be eliminated entirely if an unambiguous unlocking sequence is selected.

Whenever the telephone instrument is in the unlocked state, it is possible to change the unlock sequence by either activating a code change switch on the keypad **10** or by operating a second code sequence indicative of a code change command. Upon receiving the code change command, the control circuit **12** will accept and store in the storage device **16** the new lock sequence.

While the memory storage device **16** has been heretofore described as an electronic storage device, the present invention does not so require, and the storage device may be any method of indicating a code sequence to the control circuit **14**, e.g., coding plugs for grounding certain wires attached to the control circuit **12** and indicative of a coding sequence.

The control circuit **12** may be designed to inhibit all calls (both incoming and outgoing), inhibit outgoing calls, or inhibit incoming calls only, because the control circuit **12** controls both the dialing signal generator **18** and the switch **24** to the communication paths between the microphone **22** and the transmitter **20** and between the receiver **28** and the speaker **30**.

From the foregoing, it will be apparent that the present invention provides unique management control of the use of a mobile telephone. Only authorized users can operate the lock, and can do so without a physical key. Moreover, the use of a single code sequence for both locking and unlocking reduces the possibility of confusion between the locking and unlocking codes and lapses of memory. Requiring that the code sequence be input before locking eliminates the possibility of inadvertent locking by an error or mistake in the code sequence. Tampering is also inhibited.

These and many other advantages of the present invention will be obvious to one skilled in the art from the claims. It should be understood that the foregoing description of the preferred embodiment is illustrative only, and that many modifications may be made without departing from the spirit thereof as defined in the claims when accorded a full range of equivalents.

What is claimed is:

1. A method of managing the use of a mobile radio telephone comprising the steps of:

(a) providing a mobile radio telephone having a plurality of input keys;

(b) providing an electronic lock responsive to the successive operation of a predetermined sequence of said keys to lock and unlock the telephone;

(c) requiring entry of the predetermined sequence of keys prior to unlocking the telephone; and

(d) requiring entry of the predetermined sequence of keys prior to locking the telephone;

whereby both unauthorized use and inadvertent or unauthorized locking of the telephone may be achieved without a physical key.

2. A method of managing the use of a mobile radio telephone comprising the steps of:

(a) providing a mobile radio telephone;

(b) providing an electronic lock responsive to a single predetermined code sequence;

(c) requiring entry of the code sequence as a condition precedent to the enabling of the telephone; and

(d) requiring entry of the code sequence as a condition precedent to the disabling of the telephone,

whereby both unauthorized use and inadvertent or unauthorized disabling of the telephone may be achieved without a physical key.

3. A method of preventing unauthorized use of an electronic lock comprising the steps of:

providing an electronic lock responsive to a plurality of preselected electronic signals in a preselected sequence for opening said lock;

opening said lock by applying said plurality of preselected electronic signals in said preselected sequence; and

closing said lock only upon the receipt by said lock of said plurality of preselected electronic signals in said preselected sequence, so that said lock cannot be closed except by persons knowing said plurality of preselected electronic signals in said preselected sequence.

4. A security device for a telephone instrument comprising:

selectively operable inhibit means to prevent the use of said instrument;

signal recognition means operable to receive a plurality of signals representing a predetermined code; and

control means, responsive to said signal recognition means, to operate said inhibit means and to disable said inhibit means only upon the receipt of said predetermined code.

5. An electronic lock device to prevent unauthorized use of a telephone instrument, comprising:

digital input means for the receipt of input signals from a user of said instrument;

locking means operative to selectively prevent use of said instrument;

logic means responsive to said digital input means and controlling said locking means, said logic means enabling said locking means upon the receipt of a predetermined sequence of input signals by said digital input means and disabling said locking means upon the receipt of said predetermined sequence of input signals.

6. In an electronic lock for a telephone having an input means providing a plurality of different signals, each signal representing an input signal from a user, a memory means for storing a plurality of memory signals, each said memory signal representing at least one of said input signals and a control means for selectively inhibiting operation of the telephone, a method of preventing accidental or unauthorized operation of said control means comprising the steps of:

receiving a predetermined plurality of input signals;

comparing said plurality of input signals with said plurality of memory signals; and

operating said control means only if each of said plurality of input signals matches said plurality of memory signals, thereby to prevent persons not knowing the plurality of memory signals from operating said lock.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,724,537
DATED : February 9, 1988
INVENTOR(S) : Paul L. Monet

It is certified that error appears in the above-indentified patent and that said Letters Patent is hereby corrected as shown below:

Column 3, lines 20, 28, 35, and 61, for the drawing reference numeral "14", each occurrance, should read --12--.

Signed and Sealed this

First Day of July, 1997

Bruce Lehman

Attest:

Attesting Officer

BRUCE LEHMAN

Commissioner of Patents and Trademarks

US004724537C1

(12) EX PARTE REEXAMINATION CERTIFICATE (4926th)

United States Patent

Monet

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(54) METHOD AND APPARATUS FOR MANAGING THE USE OF AN ELECTRONIC LOCK FOR A MOBILE RADIO TELEPHONE

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(51) **Int. Cl.**[7] **H04M 1/66**

(52) **U.S. Cl.** **455/565**

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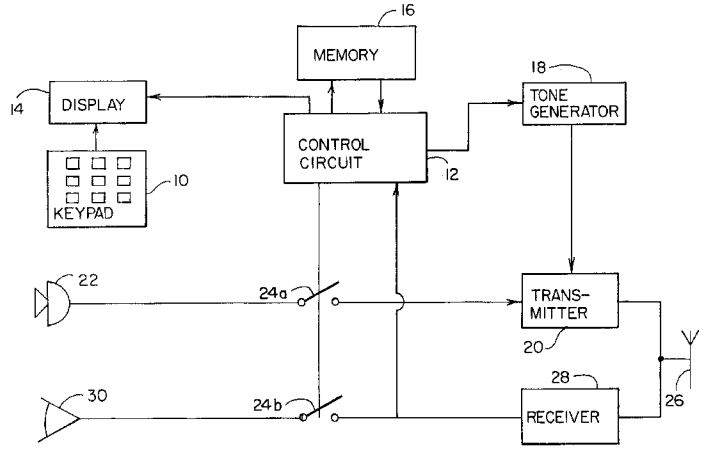
Primary Examiner—Lee Nguyen

(57) **ABSTRACT**

A method and apparatus for managing an electronic radio telephone lock in which the electronic lock can be rendered operative or inoperative only by first entering a predetermined code so as to prevent unauthorized use as well as accidental or unauthorized locking, code changes, etc.



EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims **1–5** and **6** are cancelled.

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